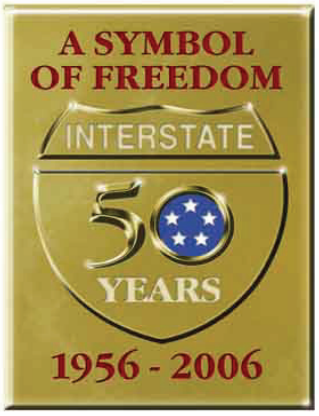

The Interstate at 50

HIGHWAY COMMISSION SURVEYING SCHOOL

Paper Presented at 10th Annual County Engineers Conference Held at
Iowa State College, December 11, 1956
by James Hoag, Personnel Engineer
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We have heard from Chet Wells on how the course was conducted and the results from the instructor's point of view. However, the important question remains unanswered and that is, did the course produce the results desired? By this, we mean were the employees that completed the course successful in performing work for which they were trained? Fortunately, we feel this question can be answered in the affirmative. Again we must remember that our aim was not to train engineers, but to train technicians. Everyone should be in agreement that it is the colleges' and universities' responsibility to educate engineers. If this were not the case, industry would long ago have been establishing its own engineering education program.

In my opinion, the surveying short course accomplished three things. First, it trained unskilled employees for semi-skilled work and, as a result, better positions; second, it has helped to relieve the critical engineering shortage; and third, it will result in a savings in engineering cost.

Last September a survey was made by polling the district and resident engineers as to the results of the men under their supervision who had completed the surveying course. The survey was made at this time for two purposes. First, to find out whether the course was a success and second, to find out whether the course should be given again. The district and resident engineers had one season's construction work to substantiate their opinions, inasmuch as the course was completed in March. All six district engineers and 22 of the 23 resident engineers stated the course was a big success. When a study was made of the residency in which we received a poor report, we found that the resident engineer had immediately assigned a party to one of his men who had completed the course. With only a little supervision to begin with the man was handed a set of plans and put out on his own. He faltered and, as a result, the resident engineer condemned the course as a failure. This, we feel, was our mistake in that we did not properly inform all engineers as to what the course was designed to accomplish.

From our poll, we found that ten of the 62 men who completed the course were being used as instrumentmen, with little or no supervision. Of these ten men, two resident engineers stated that they each had a man that was a better instrumentman than the older experienced instrumentmen under their supervision. They explained that the men who had completed the course had more interest and drive resulting in completing more work than the experienced men. One resident engineer explained that the first assignment given one of his men involved laying out a spiral. The employee laid out the spiral completely and accurately with no mistakes and no questions.

From the study that was made it was found that 30 of the 62 men were being used as assistant instrumentmen. As stated before, the goal of the course was to train the men to be assistant instrumentmen. Of these 30 men it was reported that ten would probably be ready for an instrumentman assignment next year after they received the additional experience and supervision of this year's construction program. Five men of these 30 will probably always be assistant instrumentmen or inspectors. The balance, with additional experience and supervision, will become instrumentmen and/or top inspectors. The reports indicated that the age or the youth of

some of the men was holding some of them back. The resident engineers in these cases explained the age of some of the other employees would make it difficult to give them super-visory assignments until they had received additional experience in the supervision of men.

Due to the type of construction work being performed in many of the residencies, some of the men were only used sparingly or not at all for surveying work. Also, we were not short of instrumentmen prior to the course in some of the residencies. Another reason is that we had as high as seven men from one residency who completed the school. However, the district and resident engineers pointed out that many of these men would eventually be used as instrumentmen and assistant instrumentmen. The men who were not assigned to surveying work were assigned to inspection. Even though these men were not performing surveying work, their immediate supervisors reported that the course was of great benefit.

Prior to the school the majority of the men could not read construction plans. Many of them could not make out a good construction report. For this reason, the district and resident engineers' reports were just as enthusiastic for the men assigned to inspection work as those reports for the men assigned surveying work. At least now they can read construction plans and make out the necessary reports. In fact, we had many requests to add the field of inspection to the course. However, since this school was a condensed, highly speeded-up course, it would be impossible to cover both surveying and inspection in the ten weeks school and give both adequate coverage.

We had but one bad report on one man. In studying this case it was found that the man had collaborated with his neighbor in taking the qualification examination and, as pointed out by Mr. Wells, was quite apparent throughout the teaching of the course.

There were other benefits attained from the school which are not quite so apparent. For example, the morale of the employees taking the course was extremely high. Another point is the added respect these men now have for engineers or their supervisors. During the course and after its completion, it was continually stressed that they were being trained as technicians and not engineers; that they were receiving just one small phase of an engineer's work and training. They all realized this and many commented to me personally that prior to this course they had never known what an engineer's training involved, but they certainly appreciated and respected the engineer now.

From the information I have given you and from reading the newspapers you can probably guess the answer to the question whether we thought the course was successful and should be taught again this winter. All six district engineers and 22 of the 23 resident engineers requested a repeat of the school. We have already given the qualifying examination for the course, which will again be taught this winter.

While most of you realize that there is a critical engineering shortage it is difficult to understand the scope of the problem. The 1957 Iowa Highway Commission construction program will be almost quad-rupled that of two years ago. All highway departments are experiencing the same increased work due to the Interstate Highway Program.

In 1956, this year, it has been estimated that there will be 4,400 graduating civil engineers in the United States. From past experience, it has been estimated that approximately one-fourth of the civil engineering graduates enter the highway field. This means that 1,100 graduate civil engineers are available for highway work. If all the civil engineering graduates going into the highway field were divided equally among the state highway departments, there would be approximately 22 graduates per department. Twenty-two engineers per year will take care of deaths, resignations and retirements within our own Highway Commission. However, of the 1,100

civil engineers going into the highway field, there will not be that many available engineers for the state highway departments. We have not taken into account that you, the counties, and the municipal-ities, consultants, contractors, etc., are also seeking civil engineering graduates. We should also realize that three-fourths of the graduating engineers are subject to military service and thus available for only a short time.

I do not think that we can say that the engineering shortage is creating strictly bad effects. In fact, in some ways, I think it has been a blessing. You may ask me what my reasoning is for making this statement. There have been good highway engineers and good county engineers, but unfortunately, we have also had the bad. In the past, many engineers have been poor administrators. They have been more interested in performing the detail work or mechanics of the job rather than the job as a whole. They have been technicians rather than engineers. The engineering shortage has resulted in the hiring and training of technicians, such as our surveying school, to perform the detail work. For this reason, I feel the surveying school, while it has not eliminated the need for engineers; it is helping to relieve the critical shortage of engineers. The shortage has forced engineers to perform engineering work. As a result, it has increased the engineer's position to that of an engineer. They have had to become administrators, which has resulted in adding prestige to the title "Engineer."

Along with the added prestige and additional administrative responsibilities have come increased salaries. Surely we all appreciate the engineering shortage for this reason. The Highway Commission re-cently increased the salaries for their engineers. It was necessary for two reasons. First, it was necessary to retain those engineers presently employed. An experienced engineer is much more valuable than the inexperienced.

During the last fiscal year the Illinois Highway Department employed 172 graduate engineers, they lost 221 engineers during this same period. The 221 engineers who left the employ of the Illinois Highway Department were men who had had two or more years of service with the department. While our own State Highway Department has not been hit this hard, we have lost several good engineers. Many others have received very lucrative offers and might have left without the increased salaries. However, the Illinois situation is very similar to many of the highway departments. From this is can easily be seen how some states are as far as five years behind in the design of plans for appropriations that have been and are presently available.

The salary increases were also necessary to attract new graduate engineers. For example, from information received from Professor L. R. Hillyard, Director of Engineering Student Placement at Iowa State College, I learned that the average starting salary for June 1955 graduate engineers from Iowa State College was $386 per month. The average starting salary for June 1956 graduate engineers from Iowa State College was $430 per month. This represents a yearly increase in starting salary for graduate engineers of approximately $500. The indications are that the starting salary for graduate engineers will increase next year. This is quite apparent from information received from Professor Hillyard. The graduate engineers last June received an average of seven and one-half offers for employment per graduate. This alone does not present a true picture, inasmuch as many of the graduates accepted employment with the first company interviewed, other graduates limited their interviews to a certain type of industry and others were subject to military service upon graduation, thus preventing them from accepting employment and making it useless to interview for employment.

Last year 112 graduate engineers were personally interviewed by the Iowa Highway Commission at thirteen colleges and universities. Fifteen graduate engineers accepted employment with us. Three of these fifteen graduates are foreign and available for two years only, five are veterans and seven are subject to military service within a short time. Also, five of these 15 men were graduates of non-accredited colleges. Last year's starting salary for inexperienced graduate engineers was $385 per month.

This year we have increased the starting salary to $450 per month. We have also added a classification in which all engineering graduates from accredited colleges are placed. This classification is called “Engineer in Training” and has a salary range of $450 per month to $525 per month. Upon engineering registration an engineer can advance to a salary of $550 per month. This happens to be the lowest rated registered engineer with the Highway Commission. For your information and since I feel the counties will have to increase salaries accordingly, I will list the salary ranges for the different positions paid by the Highway Commission. While the Highway Commission does not intend to solicit men from the counties, but because of the increased construction program, they are not in a position to turn trained personnel down when they apply for work.

The positions and monthly salary ranges are as follows:

Department Head	$850-$925
District Engineer	725- 800
Assistant Department Head	700- 775
Assistant District Engineer	625- 700
Resident Engineer	550- 625
Asst. Res. Engr. and Res.Inspector	500- 575
Chief Inspector & Chief Instrumentman	475- 550
Engineer in Training	450- 525

It should be remembered that all of these employees except Engineer in Training are registered professional engineers.

Other technical positions in our construction forces are as follows:

Sp. Inspector and Sp. Instrumentman	$425-$500
Sr. Inspector and Sr. Instrumentman	385- 445
Inspector and Instrumentman	340- 400
*Asst. Inspector & Asst. Instrumentman	265- 325
Jr. Inspector & Jr. Instrumentman	225- 265
Rodman	200- 240
Jr. Rodman	175- 215
Chainman	150- 170

From this information you can easily see where hiring and training technicians such as the men who completed the surveying short course is a savings in engineer cost.

So, for these reasons, I say the surveying school is providing trained technicians, who in turn are helping us meet the problem created by the shortage of engineering personnel in the face of our tremendously increased building program.

*This is the position the men are being trained for in the surveying school.